NOVEMBER 25, 2020

Aurora West Dam and Canoe Chute Inspection Report

RS&H

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PRELIMINARY
November 25, 2020
City of Aurora
West Dam and Canoe Chute Inspection
RS&H No.: 113-4293-001

Prepared by RS&H, Inc.
at the direction of
The City of Aurora

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1.1 INSPECTION SUMMARY AURORA WEST DAM AND CANOE CHUTE

The Aurora West Dam and Canoe Chute inspection was divided into two separate field visits – the first site inspection occurred on Thursday, August 27, 2020 for the dry inspection of the Canoe Chute and the wall separating the Canoe Chute from the Fox River. The weather was sunny with temperatures ranging from 80 to 90 degrees Fahrenheit. The inspection was visual on accessible features.

The inspection team included:
From RS&H:
Daniel Schmanski, PE
Charles Barber, EI
From Wang Engineering:
Met Seyhun, PE

At the time of the inspection, the Canoe Chute had flowing water to a depth of approximately 1 ft and the flow rate on the Fox River was under a low flow period with a flow of approximately 700 cfs at the Montgomery Gage. The visual inspection included the inlet structure from the Fox River, five intermediate drop structures, the outlet structure to the Fox River, and the east and west banks and walls of the Canoe Chute. The visual inspection focused on the overall condition and the identification of issues along the Canoe Chute.

See **Attachment 02** for the geotechnical report prepared by Wang Engineering, Inc.

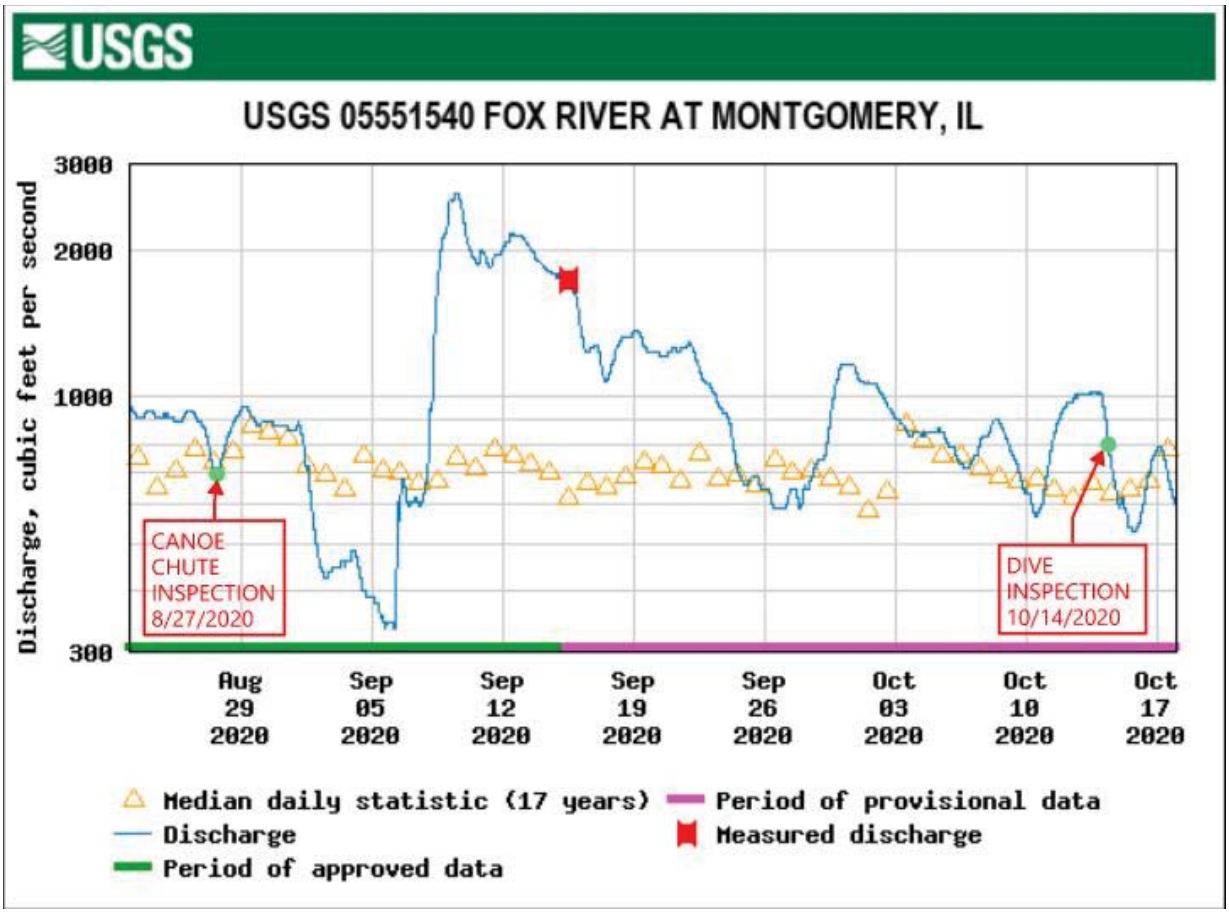
The second site inspection occurred on October 14, 2020 for the underwater inspection of the east Canoe Chute wall on the Fox River side and the West Dam. The weather was overcast and windy with temperatures ranging from 65 to 75 degrees Fahrenheit. The underwater inspection was visual on accessible features.

The inspection team included:
From RS&H:
Daniel Schmanski, PE
From Collins Engineers:
Piotr Sawulski, PE
Michael Spencer, PE
Kyle Von Holten, PE

At the time of the inspection, the Fox River was under a low flow period with a flow of approximately 800 cfs, or well below the 25th percentile flow at the Montgomery Gage, desired for safety purposes during the dive. The underwater inspection began with the east side of the Canoe Chute wall along the Fox River, then proceeded to the underwater inspection of the West Dam on the upstream and downstream sides, and finished by inspecting the Canoe Chute pool. The visual inspection focused on the overall condition of the noted underwater items.

See **Attachment 03** for the underwater inspection report prepared by Collins Engineers, Inc.

Gage location and summary of flow at the Fox River for the two inspections:



This report identifies the condition of the Canoe Chute and the West Dam from the surface and underwater inspections, and includes a priority list and conceptual cost estimate of repairs for the Canoe Chute to stabilize it so that it can be brought to an operable condition. A list of observed issues related to the West Dam and Canoe Chute East Wall area is also discussed to mitigate deficiencies noted during the underwater investigation. A conceptual cost estimate of repairs is included.

1.2 GENERAL AND BACKGROUND

The City of Aurora Canoe Chute March 2001 Operation and Maintenance Manual indicates that the Canoe Chute was last repaired in 1999 following damages from July 1996 and February 1997 flood events. The last inspection report was dated September 17, 2014, and before that, April 28, 2005. At the time of this report, the Canoe Chute was not open for operation. The Canoe Chute has an Obermeyer Pneumatic Crest Gate with an air bladder system installed to regulate water levels at the concrete Drop Structure 1 (DS1). This system was installed around 1999; however, at the time of this report, this system was not operational. In order to control water levels in the Canoe Chute, the gate has been manually operated by maintenance crews.

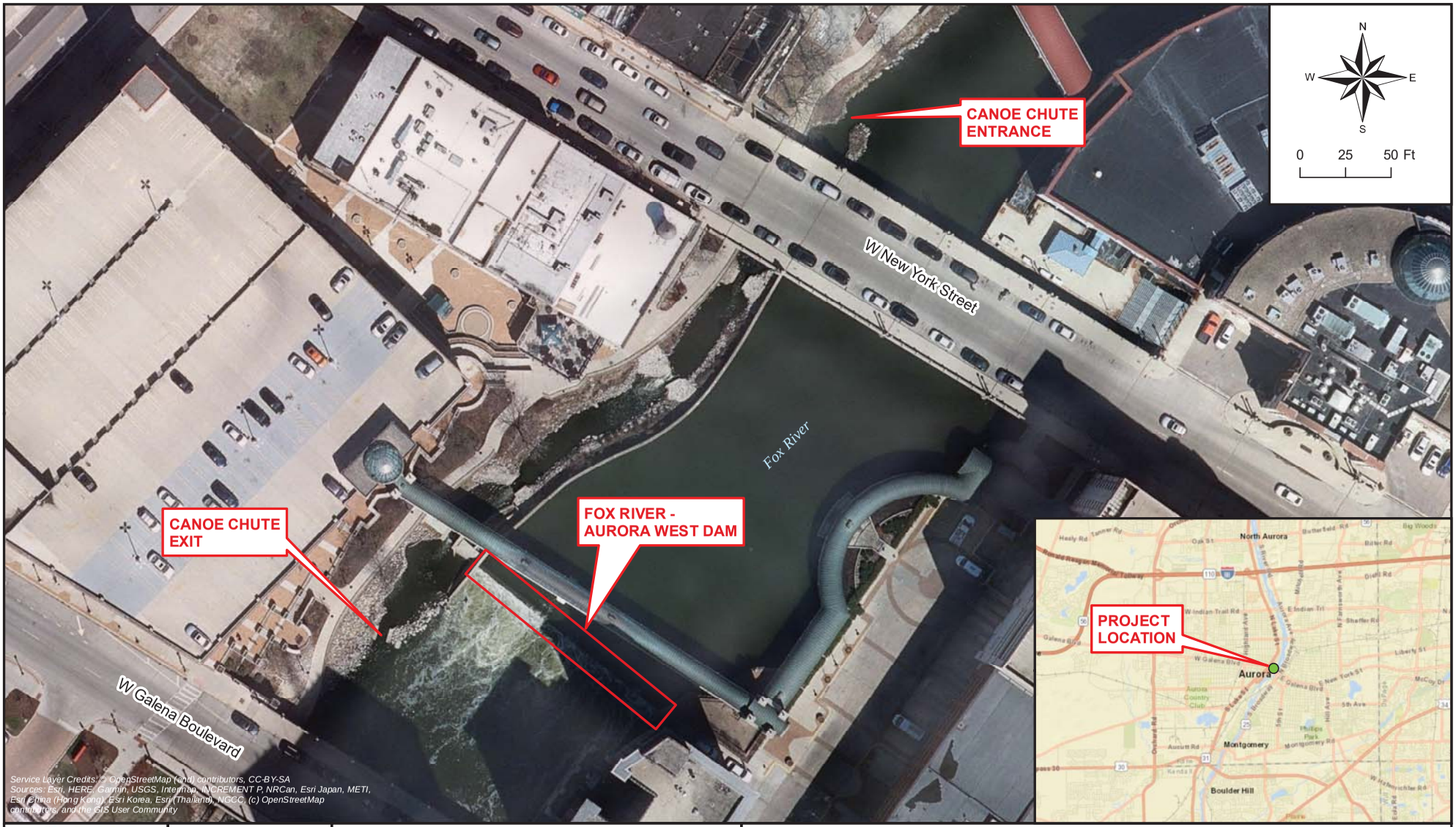
Attachment 01 contains overall site photos and detail photos from the Canoe Chute inspection and dive inspection. At the time of the visual inspection, the overall condition of the Canoe Chute was good, with minor repair items noted. **Attachment 02** includes geotechnical observations and recommendations for the Canoe Chute. The underwater inspection report was documented in **Attachment 03**. Overall, the conditions of underwater elements per the dive report were satisfactory to fair, with deficiencies noted that are not believed to pose an immediate threat or concern at this time.

The Inspection was performed in accordance with the Illinois Department of Natural Resources *Guidelines and Forms for Inspection of Illinois Dams,* (IDNR, November 1999). The completed IDNR Dam Inspection form is included as part of **Attachment 04**.

The repair recommendations are provided. However, design of those repairs is at a conceptual level only, and the cost analysis is a rough order of magnitude estimate for budgeting purposes.

Classification of the Site

See exhibit **AER 01** for a project location map. The West Dam is classified as a Class III Dam with a tributary area of approximately 1,720 sq. miles and is in a regulatory floodplain and floodway.



AURORA ILLINOIS CITY OF LIGHTS	RS&H	CITY OF AURORA - FOX RIVER WEST DAM & CANOE CHUTE INSPECTION	AURORA WEST DAM & CANOE CHUTE - AER 01 AERIAL EXHIBIT

1.3 DISCUSSION OF OBSERVATIONS

The Canoe Chute begins at the inlet structure just north of the New York Street Bridge. According to the Canoe Chute Manual, the invert elevation is approximately 2 ft below the West Dam crest to have navigable depths of flow in the chute when the river pool is at the crest of the dam. There are five drop structures along the chute and four interim bays or pools between drop structures. The Canoe Chute ends at an outlet structure downstream of the West Dam, just north of Galena Street. See exhibits **STR 01 and STR 02** for a detail map and photos. The Canoe Chute and its components are discussed below. The downstream pools are described with each drop structure, and the observations from the dive inspection are summarized. Refer to **Attachments 01 and 03** for photos of the observations discussed below.

Inlet Structure

The inlet structure was observed to be in good shape. The slots in the timber on the east and west side of the inlet structure appeared to be in satisfactory condition but can trap debris.

Drop Structure 1

DS1 was observed to have debris caught along the upstream face but was in good shape overall. The depth of flow through the structure was at a higher velocity, but no erosion was observed through the structure or downstream channel. The Obermeyer Pneumatic Crest Gate is situated on the downstream side of this structure but was not inspected, as it is not operational.

Drop Structure 2

DS2 was observed to have some deficiencies, including damaged riprap and erosion along the flares of the drop structure. There is a void between the south side of the New York Street bridge pier and the chute bank on the upstream side of DS2 and erosion-related damages to riprap upstream and downstream of DS2. In the downstream pool, there is a potential for erosion along the west wall of the chute due to a void of riprap along this wall and shrubbery that has overgrown along each bank. There are also errant stones situated in the downstream pool. Overall, the condition of the structure itself appears satisfactory.

Drop Structure 3

DS3 was observed to have some minor erosion issues on the upstream and downstream sides but was in good shape overall. Erosion has dislodged riprap as noted with other DS locations, creating voids in riprap. Towards the end of the downstream pool and approaching DS4, the east wall has an overgrowth of shrubbery.

Drop Structure 4

DS4 was observed to have some minor erosion issues on the downstream side but was in good condition overall. The roots of a large tree at the upstream west bank may pose a risk of dislodging structural members of the DS. Additionally, this structure had errant stones at the bottom. Some concrete cracks were observed along the west wall.

Drop Structure 5

DS5 was observed to have some minor erosion issues on the downstream side. The west side of the structure and the west wall show concrete cracking. Additionally, there were branches caught along the upstream side of this structure. The downstream pool connects to the chute outfall and there is a spillway along the east side of the chute to the Fox River. This spillway appeared functional; however, the grading of the top of the spillway was irregular.

Outlet

The outlet to the Canoe Chute had numerous dislodged stones but did have a clear outfall channel to the Fox River. A pipe outlet along the west wall appeared to be in satisfactory condition, although the source of the pipe outlet is unknown.

The geotechnical investigation did not identify any visible areas of seepage along the east wall but recommended removal of shrub overgrowth along the bank to provide an unobstructed view of the bank to note potential seepage locations. The dive inspection also included an overall inspection of the Canoe Chute and the drop structure bottoms (see Photo CC-4). The bottoms of the drop structures are composed of concrete and no erosion was observed. Repairs and maintenance of the Canoe Chute is discussed in the next section.

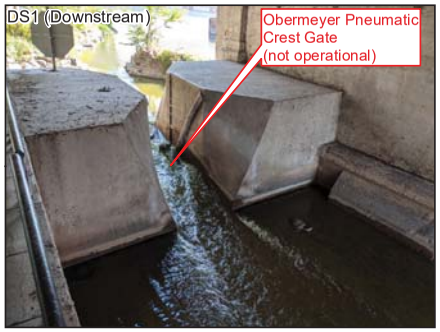
See Drop Structure (DS) Photos on Sheet 2

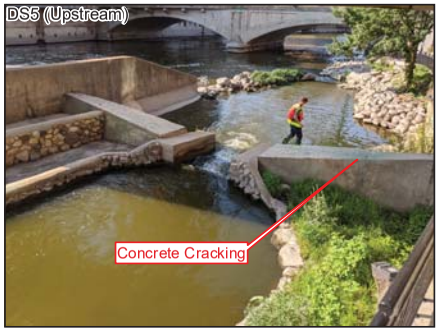
IMG01: Canoe Chute Inlet

IMG02: Canoe Chute Channel & East Wall

IMG03: Canoe Chute Outlet & Spillway

AURORA ILLINOIS CITY OF LIGHTS	RS&H	**CITY OF AURORA - FOX RIVER WEST DAM & CANOE CHUTE INSPECTION**	**AURORA WEST DAM & CANOE CHUTE - STR 01 WEST DAM AND CANOE CHUTE - REPAIR EXHIBIT WITH PHOTOS**





AURORA ILLINOIS CITY OF LIGHTS | RS&H | CITY OF AURORA - FOX RIVER
WEST DAM & CANOE CHUTE INSPECTION | AURORA WEST DAM & CANOE CHUTE - STR 02
WEST DAM AND CANOE CHUTE - REPAIR EXHIBIT WITH PHOTOS (DROP STRUCTURES)

Canoe Chute East Wall (Fox River side) and West Dam

The dive inspection of the Canoe Chute East Wall indicated the wall was in generally satisfactory condition but did have several minor hairline cracks. Seepage was observed at a construction joint along the wall. On the downstream side of the dam, the East Wall did have undermining exposing a steel caisson; however, the steel caisson did not exhibit any defects. The West Dam was generally in fair condition. The upstream side did have areas of poor concrete consolidation and debris (timber) accumulation. The east side wall had scaling observed, and the toe of the dam had undermining and voids towards the east side of the dam. See **Attachment 03** for more information.

1.4 CONCEPT LEVEL REHABILITATION PLAN

During the Canoe Chute and West Dam inspections, the recommended repairs were noted and are ranked below in order of priority. See exhibit **STR 02** for a summary of repairs noted for the drop structures.

1. At the time of the inspections, debris of mostly logs, branches, and stones were noted, and these should be removed during regular Canoe Chute maintenance in order to keep continuous flow and prevent additional buildup in the chute. The outlet structure had several stones dispersed around and these should be removed from the flow path. The West Dam also had a log over the west side of the crest that should be removed.

2. The banks of Canoe Chute should have the shrub overgrowth removed and managed as well as the large tree on the west bank removed. The roots of the unmanaged vegetation can pose potential damage to the walls, especially to the east wall. Roots along the east wall may lead to seepage. Overgrowth on the east wall along with the roots should be removed and the voids filled. The removal of the overgrowth on the east wall bank will also allow maintenance of potential seepage issues observed in future inspections.

3. The Obermeyer Pneumatic Crest Gate System should be repaired and maintained per the Canoe Chute Operation Guide. See **Attachment 05** for more information on safety, operation, maintenance, and repair. The gate was not operational at the time of the inspection and it is desirable to have the gate fixed and functional, as opposed to alternatives of installing/removing stop logs or manually lifting the gate which can present hazardous situations for maintenance personnel, such as slippery footing and difficulty in removing stop logs. **Since the gate is desired to be operational again, it**

will need to be in safe working order, and as stated in the operation guide, safety cannot be stressed enough, as there is much importance in maintaining the components of this system to avoid injuries and or damage to the system. Per the operations manual, the gate is composed of the following items that should be inspected, repaired, and maintained for safe operation.

a. Spillway Gate Assembly consisting of Gate Panel, Air Bladder, and Clamps.
b. Air Supply System
c. Control System

The Obermeyer Pneumatic Gate System has the gate and air bladder installed on the downstream side of DS1. In order to inspect this system, it is recommended that the Canoe Chute be dewatered, which can be accomplished by installing the stop logs at the inlet structure. Once dewatered, the gate panel, air bladder, clamps, connections, and seals can be inspected and repaired, if necessary. The air supply and air compressor system, including fluid levels, belts, and hoses should then be inspected, tested, and repaired or replaced, as necessary. Once the Obermeyer Pneumatic Gate System is operational again, the Canoe Chute will be able to be dewatered in a more safe and efficient manner.

4. The drop structures were observed to have erosion and scour mostly along the concrete flares which included undercutting and riprap pop outs. It is recommended that void areas be filled with grout and riprap be reset along the concrete flares, in areas of undercutting, and along the pool walls. DS5 was observed to have concrete cracking on the west part of the structure, which should be sealed. The east wall was observed to have approximately 15 hairline cracks that should be epoxy sealed on the Canoe Chute side. The Fox River side can be sealed during repair work for the West Dam. The construction joint along the East Wall where seepage was observed should be epoxy sealed.

5. The west wall of the Canoe Chute adjacent to the Fox River Trail near DS5 had concrete cracking and exposed rebar that should be repaired and sealed.

6. The spillway just upstream of the outlet should be regraded or have stones reset to create a uniform spillway crest.

7. The construction joint of the Canoe Chute East Wall on the Fox River side where seepage was observed should be sealed as necessary if this joint is unable to be fully sealed in (4). The undermining voids located at the downstream toe are not believed to pose an

immediate threat to the Dam. However, to prevent further damage and associated bearing loss, these voids should be repaired. The epoxy crack sealing in (4) during the Canoe Chute repairs can be completed for the hairline cracks extending on the Fox River side of the wall. Until these items are able to be repaired, they should be monitored during future inspections and repaired if they are observed to worsen. See **Attachment 03** for more information.

8. Additional Canoe Chute East Wall and West Dam repairs can be performed if the repairs in (7) are undertaken. The additional repairs listed here may be considered since there are considerable efforts and high costs to access and repair submerged portions of the dam and chute wall. Repair consideration can be given to the undermining under Canoe Chute East Wall where a steel caisson has been exposed. Along the crest of the West Dam, there are five areas of poor concrete consolidation and scaling along the east wall of the dam that can be considered for repair. Timber debris just upstream of the dam can also be removed. See **Attachment 03** for more information.

1.5 CONCEPTUAL OPINION OF PROBABLE COST

A conceptual cost estimate of the rehabilitation plan is summarized on the next page in Table 1. Work items that can be grouped together have been highlighted the same color.

Table 1 West Dam and Canoe Chute

Conceptual Opinion of Cost

Rehabilitation Item	Item	Quantity	Unit	Unit Cost	Cost	Notes
1 Canoe Chute Cleaning and Debris Removal	Debris Removal	1	LS	$ 1,000	$ 1,000	clear logs, branches, stones, etc. at drop structures and dam
	Other items				$ 300	30% contingency
	Rehabilitation Item 1 Subtotal				**$ 1,300**	
2 Canoe Chute Bank Landscaping Management	Brush and Root Removal and Root Hole Fill	600	SF	$ 5	$ 3,000	60 ft length x bank width 10 ft
	Tree and Root Removal and Root Hole Fill	1	EA	$ 1,000	$ 1,000	large tree on west bank near DS4
	Other items				$ 1,200	30% contingency
	Rehabilitation Item 2 Subtotal				**$ 5,200**	
3 Obermeyer Pneumatic Crest Gate System Inspection and Repair	Spillway Gate Inspection and Repair	1	LS	$ 5,000	$ 5,000	condition unknown - replacement/repairs assumed
	Air Supply System Inspection and Repair	1	LS	$ 1,500	$ 1,500	condition unknown - replacement assumed
	Control System Inspection and Repair	1	LS	$ 550	$ 550	condition unknown - replacement assumed
	Other items				$ 2,115	30% contingency
	Rehabilitation Item 3 Subtotal				**$ 9,165**	
4 Canoe Chute Erosion and Scour Repair and East Wall Repair	DS2 Erosion and Scour Repair - Riprap Placement with Grout	4.5	CY	$ 500	$ 2,250	at US and DS sides of structure, void at pier, and along west wall
	DS3 Erosion and Scour Repair - Riprap Placement with Grout	3.0	CY	$ 500	$ 1,500	at US and DS sides of structure
	DS4 Erosion and Scour Repair - Riprap Placement with Grout	2.5	CY	$ 500	$ 1,250	at US and DS sides of structure
	DS5 Erosion and Scour Repair - Riprap Placement with Grout	0.5	CY	$ 500	$ 250	at US and DS sides of structure
	DS5 Concrete Crack Repair / Epoxy Crack Seal	20	FT	$ 30	$ 600	on west side of structure
	East Wall (Canoe Chute side) Epoxy Crack Seal	85	FT	$ 20	$ 1,700	hairline crack seal and construction joint seal (seepage observed)
	Other items				$ 2,265	30% contingency
	Rehabilitation Item 4 Subtotal				**$ 9,815**	
5 Canoe Chute West Wall Repair	Concrete wall crack repair	20	FT	$ 100	$ 2,000	near DS5
	Other items				$ 600	30% contingency
	Rehabilitation Item 5 Subtotal				**$ 2,600**	
6 Canoe Chute Spillway Regrading	Spillway regrading	30	FT	$ 100	$ 3,000	reset and adjust riprap along spillway
	Other items				$ 900	30% contingency
	Rehabilitation Item 6 Subtotal				**$ 3,900**	
7 Underwater Repairs West Dam and Canoe Chute East Wall 1	Undermining Void Fill at downstream toe	2.5	CY	$ 18,000	$ 45,000	Remove debris and pump grout suitable for underwater application
	East Wall (Fox River side) Epoxy Crack Seal	150	FT	$ 50	$ 7,500	hairline crack seal and construction joint seal (seepage observed)
	Other items				$ 15,750	30% contingency
	Rehabilitation Item 7 Subtotal				**$ 68,250**	
8 Underwater Repairs West Dam and Canoe Chute East Wall 2	Undermining Void Fill at Canoe Chute East Wall	1.0	CY	$ 10,000	$ 10,000	Remove debris and pump grout suitable for underwater application
	West Dam Crest Poor Concrete Consolidation Repair	0.3	CY	$ 10,000	$ 2,500	Remove debris and pump grout suitable for underwater application
	Scaling Repair on East Wall of West Dam	0.3	CY	$ 10,000	$ 2,500	Pump grout suitable for underwater application
	Debris Removal	75	SF	$ 100	$ 7,500	Timber at approximately center of upstream side
	Other items				$ 6,750	30% contingency
	Rehabilitation Item 8 Subtotal				**$ 29,250**	
Project total					**$ 129,480**	

1.6 CONCLUSION

The inspections revealed that the Canoe Chute was in good condition overall. The issues observed along the chute were related to deferred maintenance such as cleaning and management. However, there are also more significant issues such as erosion and scour areas near the drop structures and concrete cracking. Seepage was observed along the east wall at a construction joint at the time of the inspection. It is also recommended that the shrubbery along the east wall be removed to allow for the more direct access to areas of potential seepage problems. The Obermeyer Pneumatic Crest Gate is recommended to be inspected, repaired, and returned to a working condition, as this will provide a safer way to dewater and maintain the Canoe Chute. Once the Canoe Chute shrub overgrowth is removed and the crest gate operational, an additional inspection is recommended, as the potential issues noted in this report can be observed in greater detail. The underwater inspection revealed that the Canoe Chute East Wall along the Fox River was in satisfactory condition and that the cracking and undermining observed is not a concern at this time; however, the seepage crack should be sealed. The West Dam was generally in fair condition, and issues observed on the upstream and downstream sides of the dam did not present an immediate threat or concern at this time. The undermining observed on the downstream side should be monitored until the repairs are made.